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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/811,142	03/29/2004	Kyoya Fukuda	042132	8466

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EXAMINER	
FINNEREN, RORY B	

ART UNIT	PAPER NUMBER
2828	

DATE MAILED: 02/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/811,142	FUKUDA ET AL.	
	Examiner	Art Unit	
	Rory Finneren	2828	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *29 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *7/8/2004 9/10/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-4, 8, 9 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith (3,742,382) in view of Zorabedian (6,282,215).

Regarding claim 1, Smith discloses a laser frequency stabilization device (#11) comprising:

a cell into which gas is charged (#20),

a laser frequency adjusting means (#18),

a laser beam dividing means (#19) for dividing the beam into a pump beam and a probe beam,

an ON/OFF means for cutting off the pumping beam at a constant time interval, ("chopper", #26)

a photo detector (#21) for measuring intensity of the probe beam after the probe beam is passed through the gas cell continuously and said pumping beam is passed through at intervals,

a computing means (#27) for obtaining the intensity of the probe beam detected by the photo detector, a demodulated signal of the probe beam, a difference in intensity

of the probe beam between a case in which the pumping beam is ON and OFF, and a difference in demodulated signal, and

a feedback means (#28) for feeding back information concerning the difference in the demodulated signal obtained by said computing means, to said laser frequency adjusting means which thereby stabilizes the frequency of the laser based on the information.

Although the Smith reference discloses a "tunable laser" as part of the laser frequency stabilization device, the reference does not explicitly disclose an ECDL, or External Cavity Diode Laser. External Cavity Diode Lasers were very well known in the art as tunable lasers at the time of the invention pending in the present application. Zorabedian teaches that External Cavity Diode Lasers are "widely used in lightwave test-and-measurement equipment and are becoming recognized as essential components for the rapidly expanding fields of wavelength division multiplexed (WDM) optical voice and data communications". Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to use an ECDL for the purpose of having a laser that is tunable in the laser frequency stabilization device.

Regarding claim 2, Smith discloses a gas cell that can be seen in the figure to be square pole or cylindrical in shape (Fig.1, #20). In addition, cylindrical gas cells were well known in the art as taught by Silfvast (4,369,514).

Regarding claim 3, Smith discloses the claimed invention except for the length of the gas cell being between 3 mm and 7 mm. Smith discloses a gas cell that is 100 mm long (col. 6, lines 21-22). It would have been obvious to one of ordinary skill in the art at

the time the invention was made to make the gas cell between 3 mm and 7 mm, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claim 4, Smith discloses the claimed invention except for the cell being 5 mm long. Smith discloses a gas cell that is 100 mm long (col. 6, lines 21-22). It would have been obvious to one having ordinary skill in the art at the time of the invention was made to make the length of the cell 5 mm, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Regarding claim 8, Smith discloses the claimed invention except the reference does not explicitly disclose injection current control means. Zorabedian discloses a laser frequency stabilization device including injection current control means which controls current injected into the laser (Col. 2, lines 3-8). It would have been obvious to a person skilled in the art at the time of the invention to combine the injection current control means taught by Zorabedian with the laser device of Smith for the purpose of controlling the amount of current injected into the laser.

Regarding claim 9, Smith discloses an optical chopper rotating at a predetermined velocity acting as an ON/OFF means ("chopper", #26).

Regarding claim 11, Smith discloses a laser frequency stabilization method (#11) comprising:

a beam dividing process (#19) which divides a laser beam into a pumping beam and a probe beam,

a beam introducing process for introducing the pumping beam and the probe beam into a gas-charged cell (#20),

an ON/OFF means for blocking the path of the pumping beam to the cell at a constant time interval ("chopper", #26),

a first demodulated signal obtaining process (Fig. 1, #27) which modulates the frequency of the laser beam by laser frequency adjusting means (#18) for lock-in detection to obtain a demodulated signal of the probe beam,

a second demodulated signal obtaining process (Fig. 2) in which lock-in detection which is in synchronization with said constant time interval is carried out to obtain a demodulated signal of the probe beam, and

a feedback process (#28) for feeding back, to the laser frequency adjusting means, an error signal obtained from the demodulated signal of the probe beam obtained in the second demodulated signal obtaining process.

Although the Smith reference discloses a "tunable laser" as part of the laser frequency stabilization method, the reference does not explicitly disclose an ECDL, or External Cavity Diode Laser. External Cavity Diode Lasers were very well known in the art as tunable lasers at the time of the invention pending in the present application. Zorabedian teaches that External Cavity Diode Lasers are "widely used in lightwave test-and-measurement equipment and are becoming recognized as essential components for the rapidly expanding fields of wavelength division multiplexed (WDM)

optical voice and data communications". Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to use an ECDL for the purpose of having a laser that is tunable and possesses the advantages of a diode laser over a gas laser.

Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith (3,742,382) in view of Zorabedian (6,282,215), and further in view of Lewis (5,146,185).

Regarding claim 5, The Smith and Zorabedian references disclose the claimed invention except the references do not explicitly disclose the gas inside the cell being cesium. Lewis teaches that cesium was known in the art as a frequency standard. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use cesium gas inside the gas cell for the purpose of maintaining a frequency standard inherent to cesium gas.

Regarding claim 6, The Smith and Zorabedian references disclose the claimed invention except the references do not explicitly disclose the laser's frequency being tuned to a D_2 line of cesium. Lewis teaches that tuning to a D2 line of cesium was a well-known practice in the art (Col. 5, lines 35-39). Therefore, it would have been obvious to a person skilled in the art at the time of the invention to adjust the laser so that its frequency is tuned to a D_2 line of cesium for the purpose of establishing a stable frequency output.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Smith (3,742,382) in view of Zorabedian (6,282,215), and further in view of Zhu (6,201,821).

Regarding claim 7, the Smith and Zorabedian references disclose the claimed invention except the references do not explicitly disclose that the maximum intensity wavelength of the laser beam is 850nm to 854nm. Zhu discloses that a D_2 line of cesium requires a wavelength of 852nm (col. 12, lines 56-57). Therefore, it would have been obvious to a person skilled in the art at the time of the invention to have the maximum intensity wavelength be between 850nm and 854nm since the inherent wavelength for the D_2 line of cesium is 852nm.

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Smith (3,742,382) in view of Zorabedian (6,282,215), and further in view of Sobey (5,457,707).

Regarding claim 10, the Smith and Zorabedian references disclose the claimed invention except the references do not explicitly disclose the introduction of the probe beam into a flat surface of said cell, or the introduction of the pumping beam into a side surface of said cell wherein the optical setup has optical means for increasing the beam diameter of the pumping beam. Sobey does disclose an optical setup for introducing a probe beam (seed beam) into a flat surface of a cell (Fig.1, #11, "seed beam") as well as a second setup for introducing a pumping beam into a side surface of a cell (Fig.1, #18) wherein the second setup has optical means for increasing the beam diameter of the pumping beam (prism beam expander, fig. 4 #82). Therefore, it

would have been obvious to a person of ordinary skill in the art at the time of the invention to have such a setup for the purpose of passing the beams through the cell in such a way that the photodetector will receive a satisfactory signal.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rory Finneren whose telephone number is (571) 272-2243. The examiner can normally be reached on Mon. - Fri. 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun Oh Harvey can be reached on (571) 272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Minsun Harvey
Supervisory Patent Examiner
Art Unit 2828

rbf